First of a Series on

AND FIRST, THERE WAS LIFE IN THE WATER

THE RECORD OF ANCIENT SEAS

by

DOLLA COX WEAVER

Raymond Foundation

Museum Stories, No. 350

October 3, 1959

The Record of Ancient Seas

Many, many times during the history of the earth the continents have slowly sunk and great arms of the seas have flowed in to submerge the land. Then very slowly over millions of years the land has risen again above sea level. Repeatedly during the history of the earth great mountain ranges have been slowly thrust up from the continents and have been gradually worn away by the forces of erosion: wind, water, and moving ice. All rock, wherever it may be exposed at the earth's surface, is constantly being broken into smaller and smaller pieces that are formed into soil, blown away by the winds, or carried to the ocean by rivers.

During the periods when our continent lay beneath the seas, sediments were deposited in these waters and eventually formed great layers of rock: the limy muds formed limestone, the clay muds formed shale, and the sands formed sandstone. (Rivers, lakes, and the wind also can deposit sedimentary rocks. These are called continental in contrast to the marine sediments formed in the seas. The continental deposits are often eroded soon after deposition and therefore do not give a continuous record of the earth's history.) Fossils that have been found in marine sedimentary rocks tell the fascinating history of the development of life in the seas.

If you are interested in knowing about prehistoric animals, one of the first things you will want to learn is the geologic time scale. At first the names in this time scale may seem long and hard to pronounce. Try to think of the geologic time scale as a calendar. But instead of months, weeks, and days the divisions are eras, periods, and epochs millions of years long. After you have learned the time scale, you might enjoy playing a game with yourself: try to name as many as you can of the animals that lived during each period.

Life began in the ancient seas long, long before the Cambrian period. This earliest life probably consisted of simple soft-bodied animals without shells, skeletons, or other hard parts that could become fossils. None of the animals of this time

had backbones. For more than half of the history of the earth the record of life is represented only by the trails and burrows of wormlike animals, a few spicules from sponges, and limy seaweed.

The first abundant life appeared at the beginning of the Paleozoic era. All of these animals lived in the seas and most of them were small. There were shrimplike animals, brachiopods, sponges, snails, jellyfishes, and the most important and the largest animals of this time, the trilobites.

Gradually more kinds of animals appeared—clams, corals, crinoids (unusual flower-like animals), and some of the early relatives of the starfishes, brittle stars, and sea cucumbers that we know today. Cephalopods (whose living descendants include the squid, octopus, and nautilus) were among the most highly developed animals in these seas. Toward the middle of the Paleozoic the eurypterids ("sea-scorpions") appeared. Smaller air-breathing kinds of scorpions were probably the first invertebrates to leave the seas for life on land.

The fish were the first of the vertebrates (animals with backbones), and from them have descended all the other vertebrates. Some of the earliest fish looked very different from the fish that we know today. Some of the early lobe-finned fish gave rise to the first vertebrate land-dwellers, the amphibians; and from the amphibians in turn came the reptiles, which were the ancestors of the birds and mammals.

In the Mesozoic era many kinds of reptiles left the land to live in the seas. Some of these marine reptiles (ichthyosaurs, mosasaurs, and plesiosaurs) were very large.

The latest era in the geologic time scale is called the Cenozoic. We will not tell you about this last 75 million years of the earth's history because mammals were by then the most important kind of life. And the story of the mammals is the story of land animals. However, we must remember that some mammals, too, left the land to go into the seas. About 60 million years ago the manatees, dugongs, and whales all "went to sea," followed about 30 million years later by the seals, the walruses, and the sea lions.

Save this story so that you can refer to the geologic time scale whenever you want to

CENOZOIC ERA
MESOZOIC ERA
PALEOZOIC ERA
CENOZOIC
75 million years ago
CRETACEOUS
140 million years ago
JURASSIC
175 million years ago
TRIASSIC
200 million years ago
PERMIAN
240 million years ago
PENNSYLVANIAN
280 million years ago
MISSISSIPPIAN
310 million years ago
DEVONIAN
350 million years ago
SILURIAN
380 million years ago
ORDOVICIAN
450 million years ago
CAMBRIAN
540 million years ago
PRE-CAMBRIAN ERAS
DRAWINGS NOT TO SCALE

Second of a Series on

AND FIRST, THERE WAS LIFE IN THE WATER

LIFE EXISTED ONLY IN THE SEAS

by

DOLLA COX WEAVER

Raymond Foundation

Museum Stories, No. 351

October 10, 1959

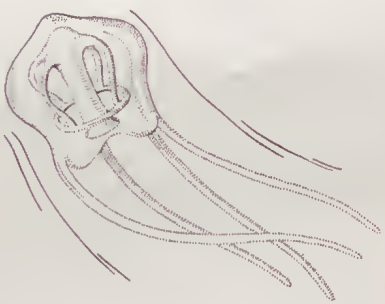
Life Existed Only in the Seas

This story is about the animals that lived in the Cambrian seas from 540 to 450 million years ago . . .

What kinds of animals lived during the Cambrian period? No animals lived on the land or in the air. There was life only in the seas. And in these seas we would have found only animals without backbones (invertebrates). The animals with backbones (vertebrates) had not yet developed. Fish are animals with backbones, and so this means that there were not even any fish in these seas. Nevertheless these seas swarmed with life. Some animals you would recognize instantly, the jellyfish, for example. But some of the others were unlike any animals living today. No one has ever seen these animals alive because they have been extinct for many millions of years. Yet we are able to learn much about them from their fossils.

Soft-bodied animals are seldom preserved as fossils. But many years ago a geologist climbed high up on Mount Wapta in British Columbia and made an amazing discovery. In a layer of black shale he found the shiny carbon impressions of segmented worms, shrimplike animals, sponges, jellyfish, and even a kind of plant (seaweed). Without his discovery we would not know what the soft-bodied animals of this period looked like.

We have a much clearer picture of what the animals with hard parts looked like because many of their fossils have been found all over the world. In quiet clear waters sponges grew



in many shapes: globes, cylinders, cones, and branches. These sponges must have lived much as sponges do today. Grown-up sponges do not move around. Baby sponges swim for a day or so and then attach themselves to rocks or shells and spend their lives pumping gallons of water through the pores of their bodies. Water contains their microscopic food. A sponge has a saclike body made of a jelly-like substance surrounding a hollow space (sponges do not have organs like hearts or stomachs). Thread-like fibers (spicules) are embedded in the walls of the sponge's body to strengthen it.

Some of the early shelled animals have left abundant remains. Brachiopods, sometimes called lamp shells, are among the oldest forms of shelled life. A brachiopod is a small animal with a two-part hinged shell; each part is called a valve (which means a door). In one of the valves of a modern brachiopod shell, or even in one 500 million years old, you may see a small hole near the hinge. A little fleshy stalk comes out through this hole and fastens the animal securely to something hard on the sea-floor. Some brachiopods today dig burrows straight down into the sand or mud and fasten their fleshy stalk at the bottom of the burrow. Some of their ancestors of millions of years ago did just the same thing.

The most conspicuous animals in the Cambrian seas were the trilobites. Some were the size of pinheads, while others were the largest animals of their time. Paradoxides, the biggest of all, was one and a half feet long. Trilobites are extinct distant relatives of crayfish and lobsters. Their outside skeletons were made of chitin and were grooved lengthwise into three lobes (chitin is the same material as the hard crustlike armor of lobsters). Trilobites had two long antennae (feelers) and many pairs of jointed legs. Some trilobites could roll up in balls, perhaps to protect themselves.

Some trilobites were scavengers, crawling about eating plant and animal debris on the muddy sea-bottoms, others burrowed in the sand and mud, and still others were swimmers. Trilobites probably laid eggs. Some fossilized objects have been found that may be trilobite eggs in little nests.

This page is for your own notes and illustrations

Story No. 1 of this Series
has a
GEOLOGIC TIME SCALE
that you may wish to refer to
as you read this story

Third of a Series on

AND FIRST, THERE WAS LIFE IN THE WATER

CORALS AND CRINOIDS APPEAR

by

DOLLA COX WEAVER

Raymond Foundation

CHICAGO NATURAL HISTORY MUSEUM
RESEARCH AND EDUCATION
FOUNDED 1893 BY MARSHALL FIELD

Museum Stories, No. 352

October 17, 1959

Corals and Crinoids Appear

This story is about the animals that lived in the Ordovician seas from 450 to 380 million years ago . . .

In the Ordovician seas all over the world floated countless millions of graptolites, animals that are known today only as fossils. Fossil graptolites look like pencil marks on the rocks (their name even means "graptos," written, and "lithos," rock). You must be very sharp-eyed to see these very small fossil animals in black shales or slates.

Graptolites always lived in colonies, never an animal by itself. The stem of a graptolite colony was commonly about an inch long and was composed of chitin. Along the stem were many tiny buds in which the animals lived. Some of the stems

were straight, some were V-shaped or spiraled, and others were attached to a bell-shaped float. Floating colonies of graptolites drifted where the currents carried them. Paleontologists believe that some graptolites may have been hitchhikers, catching free rides on drifting seaweed.

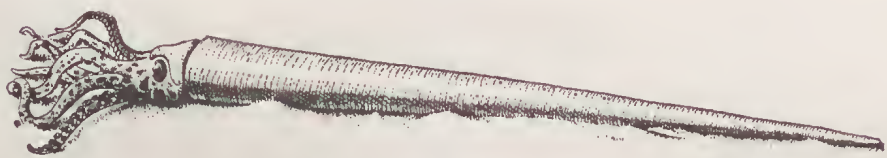
Corals are animals that you know very well today, but the Ordovician was the first period in which they lived. Corals are related to both the jellyfish and the sea anemone. Many corals live in colonies and build reefs (the ones that do not live in colonies are called solitary and some of them reach quite large sizes). The reef-making corals build "apartment houses" of limestone for themselves, depositing lime around their bodies until there isn't enough room left for them to live in. Then they move up another "story" and start all over again. Actually, the coral is a tiny animal, called a polyp, that lives inside its skeleton. The polyp has a saclike body with an opening at one end, surrounded by many tiny arms. As microscopic plants and animals float

by, the polyp's tiny arms grab the food and push it into its hollow body. Coral polyps don't do much except eat and build skeletons.

The bryozoans (moss animals) were also important reef-building animals. Fossil bryozoans might look somewhat like miniature corals to you but they are not related to corals at all. Bryozoans have always lived in colonies. The tiny bryozoan animals live inside of very small limy or chitinous tubes that join together, and the colonies of bryozoans look like bushy tufts, fans, or even gumdrops. Some bryozoans encrust rocks, corals, or shells on the bottom of seas.

Crinoids were still another new group of animals to appear in the Ordovician seas. They are relatives of the starfishes and sea urchins, but some crinoids look more like plants than animals. Among the crinoids living now, the ones with stems are often called sea lilies (there are crinoids without stems but they are called feather stars). A crinoid has a bud-shaped body with a mouth-opening in the top. Five long branching arms extend upward from the body. These arms have many tiny hairlike projections (cilia) on their inner sides that capture the food. The stems of crinoids are made up of dozens of tiny limy plates. These round, oval, or star-shaped plates from crinoids that lived millions of years ago are very often found as fossils. If you should find one of these plates, look for a round hole in the center. This opening was the passageway for a nerve and ligament when the crinoid was alive. It is also possible to find fossil crinoids with body, arms, and stem still joined together.

The largest animal in these seas was Endoceras, with a shell fifteen feet long that was shaped like a slender ice-cream cone. From the large open end of the shell projected its head and arms, looking like those of its distant relative, the giant squid. Endoceras belonged to the group of sea animals called cephalopods ("head-foot"), a kind of mollusk.



This page is for your own notes and illustrations

Story No. 1 of this Series
has a
GEOLOGIC TIME SCALE
that you may wish to refer to
as you read this story

Fourth of a Series on

AND FIRST, THERE WAS LIFE IN THE WATER

"SEA-SCORPIONS," GIANTS OF THEIR DAY

by

DOLLA COX WEAVER

Raymond Foundation

Museum Stories, No. 353

October 24, 1959

"Sea-scorpions," Giants of Their Day

This story is about the animals that lived in the Silurian period from 380 to 350 million years ago . . .

The giants of Silurian times were the eurypterids. A fossil eurypterid nearly eleven feet long was found near Buffalo, New York. These animals died out millions of years ago. Eurypterids were related to scorpions and sometimes are called "sea-scorpions." They had long flat bodies covered with an armor of chitin. There were usually two legs equipped with pincers at the front of the head and several pairs of walking legs beneath the front part of the body. The last pair of walking legs was usually equipped with oarlike flippers. These last legs puzzle paleontologists because eurypterids were sluggish bottom-crawlers rather than open-sea swimmers. Perhaps in their feeble attempts to swim, eurypterids flipped over on their backs and used their paddles as stabilizers.

Many eurypterids lived in quiet, partially enclosed lagoons. Some were scavengers and others were predators. One kind, Pterygotus, must have had a very difficult time in feeding. Pterygotus could not put anything in its mouth that it had caught in its pincers because it did not have "elbows." So it probably dropped its prey on the sandy bottom and then swam back to scoop up this meal with its shovel-like mouth.

Crinoids were extremely important during the Silurian. There are great layers of limestone in many parts of the world that are composed almost entirely of fragments of crinoid skeletons. Chain corals and cup corals were building great reefs in many places in the Silurian seas (today you find these reefs as fossils still occupying the same areas but now hundreds of miles inland). The moss animals (bryozoans) also continued as important reef-builders. Sponges, trilobites, and brachiopods were all abundant animals.

The cephalopods were less numerous than they had been in the Ordovician seas but some unusual kinds had developed. One of these had a shell with such a small opening that the ani-

mal couldn't stick its head out. Graptolites (the animals whose fossils resemble pencil marks) were becoming more scarce.

The first of the vertebrates, the fish, appeared during Ordovician times. Unfortunately, only scraps of their bony armor are found. These fragments are not enough to give us a good idea of how these fish must have looked. But scientists are able to learn much more about them from the fossils of fish that lived later in Silurian times. Many of these early fish had left the seas to live in streams and lakes.

The primitive fish have been named ostracoderms (shell-skinned). These little fish were a few inches long. In most of them the head and front part of the body were covered by rigid armor while the back part of the body and the tail were covered by flexible armor of large scales. The armor may have served

to protect these early fish from the terrible pincers of eurypterids, but it must have made them inefficient swimmers. They probably swam by a tadpole-like wiggling of the tail and rear part of the body. Most ostracoderms did not have paired fins to aid them in swimming nor did they have jaws for biting. Many were bottom-feeders and swam slowly along, drawing in water and mud containing food particles through the mouth and filtering this through the gills. Some ostracoderms with long slender bodies may have been the ancestors of the lampreys that live today. Unlike lampreys, they were probably not parasitic.

This page is for your own notes and illustrations

Story No. 1 of this Series
has a
GEOLOGIC TIME SCALE
that you may wish to refer to
as you read this story

Fifth of a Series on

AND FIRST, THERE WAS LIFE IN THE WATER

REIGN OF THE ANCIENT FISHES

by

DOLLA COX WEAVER

Raymond Foundation

Museum Stories, No. 354

October 31, 1959

Reign of the Ancient Fishes

This story is about animals that lived during the Devonian period from 350 to 310 million years ago . . .

More brachiopods lived in the Devonian seas than at any time before or after. From our country alone more than seven hundred different kinds of brachiopods have been found in rocks of this age. Reefs were being built in many parts of the world. By this time corals had taken over most of this important activity from other reef-builders. Bryozoans were still plentiful but they were not the leading reef-makers.

Crinoids were still important animals in these seas. Starfishes and brittle stars probably were quite numerous also, but because they break apart after death they are not often found as fossils. However, an unusual find was made near Mount Marion, New York. About 300 million years ago a community of starfishes on the sandy sea-floor was suddenly buried by an underwater landslide and was preserved intact. Today you can see on a slab of this sandstone more than four hundred fossil starfish, some of them still holding fast to the clams that they had been eating when they were buried.

Fishes with true jaws and paired fins appeared during Devonian times. Among them were bony fishes that belonged to three groups that still survive: the lungfishes, the lobe-finned fishes, and the ray-finned fishes.

Lungfishes breathe through gills as do other fish, but they also have lungs that allow them to breathe air when the water becomes stagnant or to burrow in the mud and survive during dry spells. Early lungfishes lived both in the sea and in fresh water, but today only three kinds of lungfish survive in streams —one kind in Australia, another kind in South America, and a third kind in Africa.

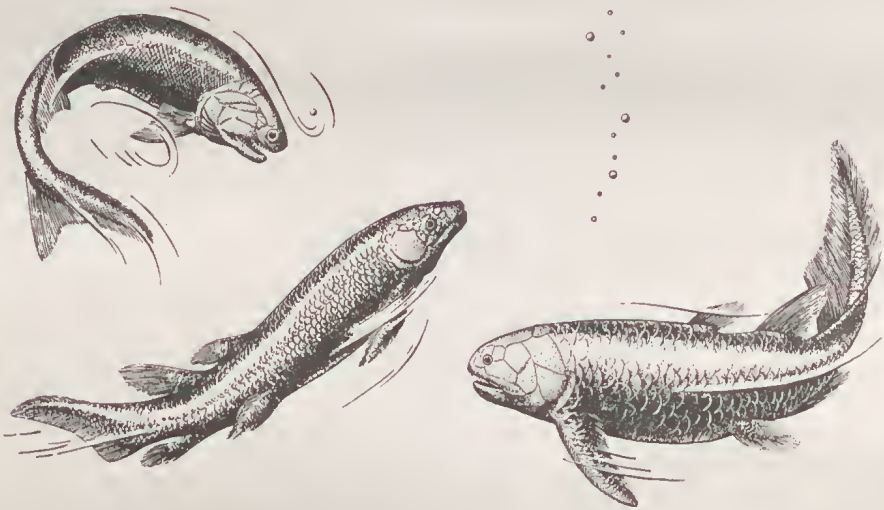
Lobe-finned fishes of the Devonian seas also must have had lungs. It was from this group that the first land-dwellers with backbones, the amphibians, developed. The arrangement of the bones in the legs of these early amphibians is remarkably

similar to that in the fins of lobe-finned fishes. Scientists thought that all of the lobe-finned fishes had been extinct for approximately 75 million years. You can imagine the great excitement when a lobe-finned fish was caught off the coast of South Africa a number of years ago.

Ray-finned fishes that lived during Devonian times had fins with a short inner skeleton, but the webs were stiffened by long skin-rays. Some of these fishes had large eyes. Frequently the mouth of a ray-finned fish was so long that it extended nearly the full length of its head. These fishes were not large, and at this time they were not plentiful. Yet it is from these distant ancestors that most of the varieties of bony fishes that we have today developed.

The placoderms were a group of armored fishes that lived at this time. Although they developed many varieties and were numerous, few, if any, survived the end of the Devonian period. The placoderm Dinichthys ("terrible fish") was one of the largest fish in the seas and may have been twenty feet long. It resembled a huge catfish with a great broad head incased in armor. It had no teeth, but its jaws had sharp scissor-like cutting edges with tusklike projections.

There were primitive sharks swimming in these waters but, because shark skeletons are composed of cartilage rather than bone, fossil skeletons are rare. Shark teeth and spines, however, are commonly found in rocks of this age.



This page is for your own notes and illustrations

Story No. 1 of this Series
has a
GEOLOGIC TIME SCALE
that you may wish to refer to
as you read this story

Sixth of a Series on

AND FIRST, THERE WAS LIFE IN THE WATER

MANY ANIMALS DISAPPEAR

by

DOLLA COX WEAVER

Raymond Foundation

Museum Stories, No. 355

November 7, 1959

Many Animals Disappear

This story is about animals that lived in the Mississippian, Pennsylvanian, and Permian seas from 310 to 200 million years ago . . .

During most of the tremendously long time of 110 million years a large part of the area known today as Nebraska, Kansas, Oklahoma, and Texas lay beneath the seas. Do you know the kinds of animals that lived in this ancient sea?

On the floor of this large sea during Mississippian times were large "gardens" of the flower-like animals, the crinoids. These animals were probably brilliantly colored in shades of yellow, orange, lilac, and even silver and black. After this time, the crinoids were never again to be as numerous nor to have as many different forms. But the descendants of this once-plentiful group are still living in today's oceans from the Arctic to the Antarctic.

In the same seas you also could have seen blastoids. At first glance these animals look like their relatives, the crinoids, but they are somewhat different. Each blastoid body resembles a bud with five "petals" tightly closed. There are no blastoids living anywhere in the world today.

Masses of brachiopods covered the sea-floor in countless numbers. An unusual new group of brachiopods with spines appeared for the first time. The large sharks may not have found it easy to swallow them. The largest of the brachiopods, nearly twelve inches across, belonged to this spiny group.

The rocks and discarded shells on the sea-floor were encrusted with the lacy bryozoans. One unique lacy bryozoan, Archimedes, spiraled around seaweed for support as it grew. Archimedes was shaped like a huge screw. Look up the inventions of the Greek mathematician, Archimedes, to see if you can discover why this fossil was named after him. (When you walk across the marble floors of the main hall of Chicago Natural History Museum, look carefully and you can see these unusual fossils underfoot.)

In Mississippian seas it would have been possible to catch an occasional glimpse of a trilobite hiding behind a large coral or swimming frantically to escape danger. What had happened to the once-numerous trilobites, the largest and most intelligent animals in the Cambrian seas? No one really knows, but sharks may have helped to cause their disappearance. This was the time of many different kinds of shell-crushing sharks, their jaws paved with knobby teeth.

During Pennsylvanian times many of these same kinds of animals continued to live in the seas. But a new group, the fusulines, became very important. Fusulines belong to that group of one-celled animals called Foraminifera. Fusulines are the size and shape of grains of wheat. The walls of their limy shells had incredibly small openings through which the fusulines extended threadlike projections of their bodies for feeding and swimming. Geologists call the fusulines "rock-making animals." In many sections of our country you can see layers of limestone several feet thick that are composed almost entirely of the shells of billions of tiny fusulines.

During Permian times the climate became arid and less of our continent was covered by seas than at any time before. The seas slowly became smaller and smaller and eventually shrank to dead seas. Central North America became a desert with sand dunes and salt deposits. With these changes in the climate came changes in the animal life: the corals, bryozoans, and crinoids were never again to be as widespread. The eurypterids (giant "sea-scorpions"), the trilobites, the graptolites, and the blastoids disappeared forever.

This page is for your own notes and illustrations

Story No. 1 of this Series
has a
GEOLOGIC TIME SCALE
that you may wish to refer to
as you read this story

Seventh of a Series on

AND FIRST, THERE WAS LIFE IN THE WATER

CEPHALOPODS AND HORSESHOE CRABS

by

DOLLA COX WEAVER

Raymond Foundation

CHICAGO NATURAL HISTORY MUSEUM
RESEARCH EDUCATION
FOUNDED 1893 BY MARSHALL FIELD

Museum Stories, No. 356

November 14, 1959

Cephalopods and Horseshoe Crabs

This story is about invertebrate animals that lived in the Mesozoic seas from 200 to 75 million years ago . . .

The Mesozoic seas swarmed with many beautiful kinds of cephalopods. The squid, octopus, and nautilus are cephalopods that are living today. Another kind of cephalopod, the belemnites, became extinct at the end of the Mesozoic era about 75 million years ago.

Most cephalopods have a shell covering. Squids and octopuses are exceptions, but the squids do have a shell inside their bodies. As the cephalopod and its shell grow, the soft body hitches forward within the shell, sealing off the old part with a thin partition. This abandoned room becomes filled with gas that helps the animal to balance its shell more easily. Cephalopods are truly jet-propelled: they can pull in water through the gills and send it out through a funnel below the mouth, shooting off backward at great speed. However, to swim forward they use their arms and move more slowly. Cephalopods have many arms covered with suckers or hooks that are used to grab prey. All of the living cephalopods have large eyes and keen eyesight. Each has a horny beak, shaped somewhat like a parrot's, which it uses for killing and tearing apart its prey.

Belemnites were very important during this era, especially during the Jurassic period when some of them reached lengths of six feet. Belemnites will instantly remind you of squids and

they were also jet-propelled. The skeleton (shell) inside of a belemnite is shaped like a cigar. Paleontologists know that belemnites had ink sacs like those of the squids today because they have found fossils with this sac preserved as a blackish impression. They have been able to make ink from this material!

Along the seashore from Maine to Mexico you can see horseshoe crabs, animals whose ancient pedigree you may not have suspected. They are true "bluebloods"—their blood is really bluish! And their ancestry can be traced back more than 350 million years. Horseshoe crabs aren't actually crabs. They are related to both spiders and scorpions and may also be relatives of the long-vanished trilobites.

Two hundred million years ago horseshoe crabs looked much as they do today. If you turn a horseshoe crab over, you will be surprised to see how small its body is in comparison with its shell. Its large bowl-like shell and its spikelike tail are of chitin. Its jawless mouth, which is on the underside of its body, is surrounded by six pairs of legs. Five pairs of these legs are used for walking. These legs also have a series of small spines for grinding food.

Horseshoe crabs are able to come out on land, for perhaps as long as a day at a time. When the mother horseshoe crab is ready to lay her eggs, she uses the curved front edge of her shell to scoop out a nest an inch or two deep in the sand up on the shore. In it she lays 200 to 300 eggs, which are green slippery globules. These eggs are very small—about ten of them would fit on a nickel. It takes from three to ten weeks for the eggs to hatch, depending on how hot the weather is. The horseshoe-crab babies are very, very small when they hatch. They do not have tails, and they look exactly like fossil trilobite babies. As soon as horseshoe crabs are hatched, they scurry toward the sea. This is a very dangerous time for them because many kinds of shorebirds are waiting to gobble them as they struggle to reach the water. During their first year they shed their outer covering of chitin several times and grow to about an inch in length. By the time the horseshoe crabs are four years old they may be two feet long.

This page is for your own notes and illustrations

Story No. 1 of this Series
has a
GEOLOGIC TIME SCALE
that you may wish to refer to
as you read this story

Eighth of a Series on

AND FIRST, THERE WAS LIFE IN THE WATER

GIANT REPTILES INVADE THE SEAS

by

DOLLA COX WEAVER

Raymond Foundation

CHICAGO NATURAL HISTORY MUSEUM
RESEARCH EDUCATION
FOUNDED 1893 BY MARSHALL FIELD

Museum Stories, No. 357

November 28, 1959

Giant Reptiles Invade the Seas

This story is about the vertebrate animals in the Mesozoic seas from 200 to 75 million years ago . . .

Reptiles developed on the land but, particularly during the Mesozoic era, many of these reptiles became sea-going.

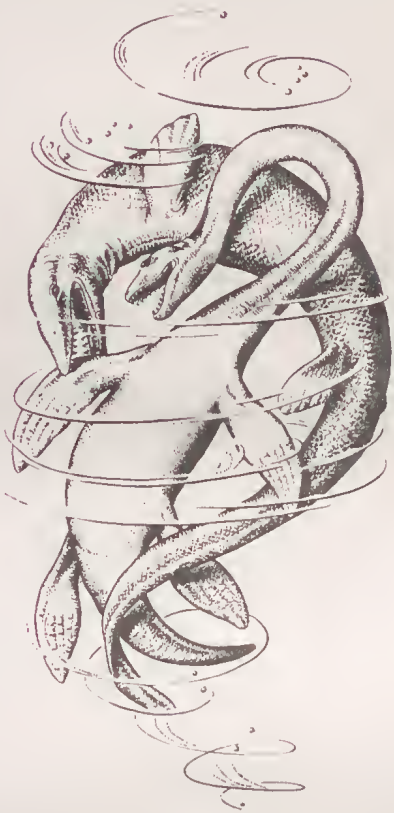
The name ichthyosaur means "fish-lizard," but these animals were not related to fish or to lizards. They were marine reptiles but their shape resembled that of the sharks of today, and some were thirty feet long. Ichthyosaurs had on their bellies two pairs of short paddle-like fins for steering. They swam by undulating their bodies and tail fins sidewise. They had very long jaws with many sharp teeth for devouring their prey. Chicago Natural History Museum has a beautifully preserved ichthyosaur that shows not only the skeleton but also a carbon impression of the fins and body outline. Without such unusual finds paleontologists could not have been positive that ichthyosaurs had fins on their backs because there were no skeletal supports to indicate fins.

It is known that these ferocious fast-swimming reptiles ate belemnites. Paleontologists very often find large numbers of belemnite arm hooks between the rib bones (where the stomach was located in life) of the ichthyosaur skeletons. It has been discovered also that the baby ichthyosaurs developed in the body of the mother and were born alive. This is known from the discoveries of ichthyosaur skeletons containing tiny skeletons. However, it is believed that these tiny skeletons in a few ichthyosaurs may represent very young ones that were eaten by ichthyosaur cannibals.

The plesiosaurs were another group of marine reptiles. Some of them were larger than the ichthyosaurs and reached lengths of fifty feet. Plesiosaurs had short heavy bodies and short tails. They paddled with huge flippers rather than swimming with the fishlike undulations of the ichthyosaurs. Most of the plesiosaurs had very long flexible necks that they whipped from side to side in catching fish. One kind of plesiosaur had seventy-six

neck bones (you have seven). Most of these marine reptiles had small heads and sharp spikelike teeth. However, a plesiosaur, Kronosaurus, whose fossil skeleton is found in Australia, was quite different. It was forty-two feet long and six feet wide across its body and had a triangular-shaped skull that was nine feet long. Its jaws were armed with eighty teeth, some of which were more than eight inches long. Kronosaurus, with a neck only ten feet long, belonged to the group of plesiosaurs that had short necks.

During the last part of the Mesozoic still another group of marine reptiles developed, the great mosasaurs. These reptiles reached lengths of thirty feet. They had long heads, short necks, long slender bodies, and very long tails that were used in swimming. Mosasaurs were ferocious flesh-eaters with long, sharp, conical teeth along their jaws and teeth even in the roofs of their mouths. Their double-jointed lower jaws permitted them to open their mouths especially wide when swallowing large prey. The mosasaurs were more closely related to the lizards than to the ichthyosaurs. They had scaly skins like the skins of lizards.



Can you imagine most of present-day Kansas as a great inland sea about 120 million years ago? There were thirty-foot mosasaurs, ten-foot marine turtles, and large fish in this sea. Scientists know this is true because they find fossils of these animals in Kansas.

Like some of the other animals whose history you have been following, the ichthyosaurs, the plesiosaurs, and the mosasaurs vanished at the end of the Mesozoic era.

This page is for your own notes and illustrations

Story No. 1 of this Series
has a
GEOLOGIC TIME SCALE
that you may wish to refer to
as you read this story